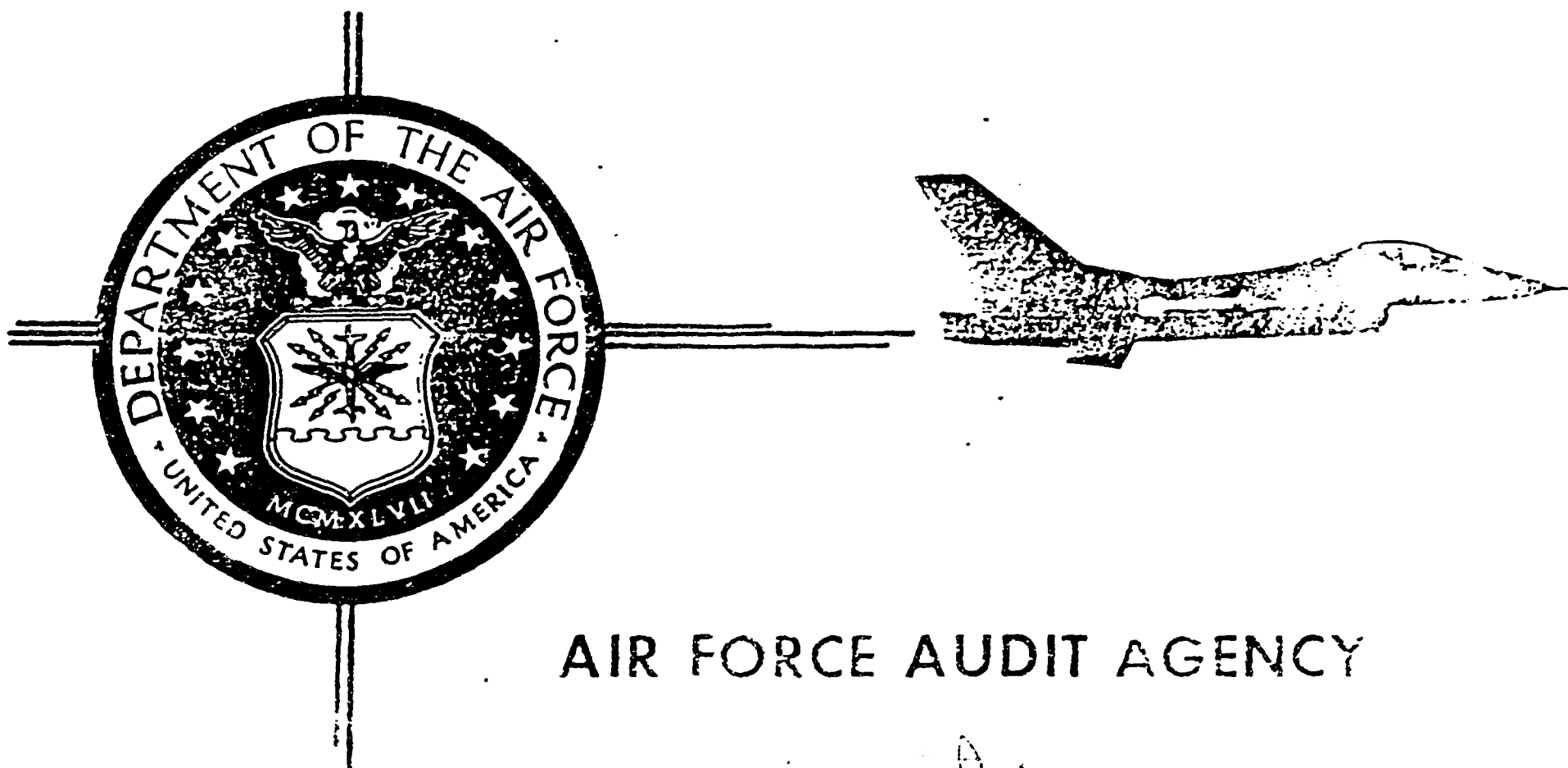


Project 3040213

25 November 1983

REPORT OF AUDIT

REVIEW OF THE SPACE BASED SPACE
SURVEILLANCE SYSTEM--AN FY 1984
MAJOR SYSTEM NEW START





DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE AUDIT AGENCY
NORTON AIR FORCE BASE, CALIFORNIA 92409

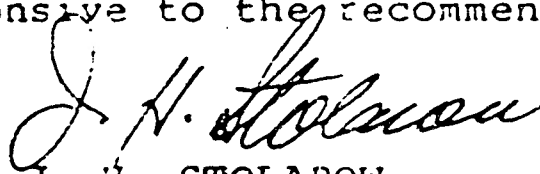
Project 3040213

TO THE SECRETARY OF THE AIR FORCE
AND THE CHIEF OF STAFF

This report summarizes our evaluation of the Air Force's planning and preparation for the Space Based Space Surveillance (SBSS) system as a fiscal year (FY) 1984 major system new start within the Defense Systems Acquisition Review Council (DSARC) process. This evaluation, accomplished in response to a September 1982 request from the Deputy Secretary of Defense, was part of a DOD-wide review of DSARC programs. The audit focused primarily on the adequacy of documentation, validity of requirements, and Air Force compliance with DOD and Office of Management and Budget (OMB) guidance, including the Deputy Secretary's initiatives for improving the acquisition process.

Our review disclosed that the Air Force's planning and documentation to support the SBSS as a major system new start for FY 1984 were generally consistent with DOD and OMB guidance, including the Deputy Secretary of Defense's initiatives for improving the acquisition process. However, we noted that although the program acquisition strategy contained significant concurrency and technological risks, a DSARC I review was not planned. Additionally, the funding levels requested by the Air Force in the FYs 1985-89 Program Objective Memorandum were not consistent with the SBSS system design concept and acquisition strategy as of July 1983.

Air Staff officials agreed with the audit results and planned corrective actions are responsive to the recommendations.


J. H. STOLAROW
The Auditor General

AIR FORCE AUDIT AGENCY

Project 3040213

REVIEW OF THE SPACE BASED SPACE
SURVEILLANCE SYSTEM--AN FY 1984
MAJOR SYSTEM NEW START

25 November 1983

Directorate of Acquisition and Logistics Systems
Wright-Patterson AFB, Ohio

REVIEW OF THE SPACE BASED SPACE
SURVEILLANCE SYSTEM--AN FY 1984
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EXECUTIVE SUMMARY

REVIEW OF THE SPACE BASED SPACE SURVEILLANCE PROGRAM--AN FY 1984 MAJOR SYSTEM NEW START

INTRODUCTION

The Space Based Space Surveillance (SBSS) system was originally conceived as a system development based on the technology demonstrated by the Space Infrared Sensor (SIRE) program. The SIRE technology was intended to demonstrate the capabilities of a long wavelength infrared surveillance system, using infrared signatures to detect and track objects in space. On 7 May 1982, the Air Force, based on SIRE's limited operational utility for its significant cost, directed the Air Force Systems Command (AFSC) to terminate the SIRE program and proceed with preliminary design and development of a prototype SBSS satellite based on long wavelength infrared technology experience gained from SIRE. Detailed requirements for space surveillance, which were being developed at the time by an Air Force-wide Space Surveillance Architecture Study chaired by the Space Command (SPACECOM), were subsequently reviewed and approved by the Air Staff. The SBSS program is being managed by the Space Defense Systems Program Office at AFSC's Space Division.

The objective of the SBSS program is to develop and procure a satellite system capable of rapidly detecting and tracking objects in space, including new foreign launches. Using longwave infrared technology, the system will provide improved capabilities over existing systems by continuously monitoring space objects both at low and high altitudes. As a result, it will provide the National Command Authorities and user commands with information necessary to monitor all space activities, protect U.S. and Allied space assets against attacks, and negate hostile space capabilities during time of war.

The Program Office currently plans to release requests for proposal for the concept exploration phase in November 1983 and award contracts in early calendar year 1984. As of July 1983, the concept exploration phase, which could include limited demonstration and validation, was expected to extend from fiscal years (FY) 1984 through 1986, followed immediately by a Defense Systems Acquisition Review Council (DSARC) Milestone II review and full-scale development from FYs 1987 through 1990. Full production was expected to begin in FY 1989. A preliminary life cycle cost estimate for the SBSS

system, prepared in July 1983 by a support contractor (Aerospace Corporation), totalled about \$20.5 billion (then-year dollars). This estimate, however, had just been prepared at the completion of our audit and, therefore, had not been thoroughly reviewed or approved by the Program Office.¹

PURPOSE AND SCOPE

On 3 September 1982, the Deputy Secretary of Defense requested the Department of Defense (DOD) Office of the Inspector General to review selected programs which were proposed as major system new starts for FY 1984 (Appendix III). As part of this overall review, the DOD Office of the Inspector General requested the Air Force Audit Agency to review the SBSS program. The overall objective of the audit was to assess the Air Force's planning for the SBSS system as an FY 1984 major system new start within the DSARC process. Specifically, we determined whether:

- Documentation supporting the SBSS as an FY 1984 major system new start met the requirements of selected Deputy Secretary of Defense acquisition initiatives and complied with Office of Management and Budget (OMB) and DOD directives.
- Mission requirements were based on a mission area analysis.
- Adequate use of competition was planned in each phase of the acquisition.
- Acquisition strategy met the requirements of OMB and DOD major system acquisition guidance.
- Budget/cost estimates were realistic and accurately represented the program.

¹ As of the date of this report, revisions to both the SBSS acquisition schedule and cost estimate were under consideration. The revised acquisition schedule would extend full-scale development through FY 1994, and begin production in FY 1993. A revised cost estimate of \$6.7 billion (FY 1983 dollars) had been prepared. However, it was not fully documented and had not been formally approved by the Program Office.

- Integration of the DOD Planning, Programming and Budgeting System (PPBS) and the DSARC process was planned.

Audit field work was accomplished at HQ USAF, HQ Space Command, HQ Strategic Air Command, HQ AFSC and its Space Division (Appendix I). It included an examination of the procedures and selected documentation pertinent to the audit objectives and originating during the period January 1979 through July 1983. Army and Navy positions relative to selected program issues were obtained from the DOD Office of the Inspector General. The audit, which was accomplished in accordance with generally accepted Government auditing standards, started in March 1983. A draft of this report was provided to management in August 1983.

OVERALL EVALUATION

The Air Force's planning process and documentation to support the SBSS as a major new program for FY 1984 were generally consistent with the Deputy Secretary of Defense Initiatives on Improving the Acquisition Process and DOD and OMB guidance. The using command (Space Command) had conducted a mission area analysis to determine requirements, and the Space Defense Systems Program Office had planned for adequate use of competition. However, even though the Program Office had devised an acquisition strategy which contained significant concurrency and technological risk, this strategy excluded a DSARC Milestone I review. In addition, the Air Force's FY 1985-89 Program Objective Memorandum could be understated by about \$1 billion because it did not reflect the current SBSS design concept or acquisition strategy (as of July 1983). These factors, unless corrected, may prevent the successful integration of the PPBS and DSARC processes and may cause schedule slips and cost increases.

ISSUES DISCUSSED IN THIS REPORT

PROGRAM ACQUISITION STRATEGY.

The SBSS program acquisition strategy included technological risks and a highly concurrent, success-oriented schedule that could result in schedule slips and cost increases. Further, the program was not scheduled for a

DSARC I review and did not have cost, schedule and performance thresholds against which the program's success could be measured at DSARC II. (Page 5)

COST ESTIMATING AND FUNDING.

Sufficient funds may not be available to ensure SBSS program stability and progress because the funding requested in the Air Force FY 1985-89 Program Objective Memorandum was not consistent with the July 1983 SBSS system concept or acquisition strategy. (Page 11)

.. EVALUATION OF MANAGEMENT COMMENTS

Management comments and actions are responsive to the issues and recommendations discussed in this report.

PROGRAM ACQUISITION STRATEGY

BACKGROUND

1. Acquisition Cycle. The process of acquiring a major weapon system is normally divided into four phases. These are:

- Concept Exploration. The exploration of various concept alternatives to determine how best to solve a deficiency which has been identified in a mission area analysis. At the completion of this phase, a Defense Systems Acquisition Review Council (DSARC) performs a Milestone I review to determine whether the program should proceed to the next phase.
- Demonstration and Validation. The development, fabrication, and testing of prototypes to prove the validity of the selected concepts. Upon completion, a DSARC II review is made to determine whether the program should proceed.
- Full-Scale Development. The conduct of detailed system engineering, operational test and evaluation, and production and logistics planning.
- Production. Fabrication, assembly, and deployment of the system.

DSARC I approval for the system to proceed to the next acquisition phase includes the formal endorsement of cost, schedule, and performance thresholds in a system concept paper. These thresholds are used at DSARC II to measure the program's performance and are again formally established in a decision coordinating paper.

2. Program Concurrency. Department of Defense (DOD) Directive 5000.1, Major System Acquisitions, dated 29 March 1982, allows the Services to tailor acquisition strategies to fit each program to minimize acquisition time and cost, consistent with the need and technical risk involved. Consequently, strategies such as lead time reductions through concurrency, experimental prototyping of critical components, and combining or omitting phases may be appropriate to reduce acquisition time and cost. However, when these alternatives are

TAB A

considered, it is imperative that clear Service and/or DOD guidance is given to ensure that program direction is logical, appropriate and commensurate with the risk.

DISCUSSION

3. Technology Risk and Schedule Concurrency. Even though the Space Based Space Surveillance (SBSS) program acquisition strategy (as of July 1983) included technological risks and a highly concurrent, success-oriented schedule, it was not scheduled for review at DSARC I. Instead, Air Force Systems Command (AFSC) and Deputy Chief of Staff/Research, Development and Acquisition (HQ USAF/RD) officials planned to brief the program to the Under Secretary of Defense (Research and Engineering). Although these officials believed this briefing would provide sufficient visibility for the SBSS program, it is our opinion that, without a DSARC I review, the program acquisition strategy will not have a formal, high-level review and will not have formally established cost, schedule, and performance thresholds against which its success can be measured at DSARC II.

a. Technology Risks. Technologies for the four key components of the SBSS system (cryogenic cooler, focal plane, optics, and signal processor) were in development, and therefore, had not been fully proven or demonstrated. The Program Office had designated the development and demonstration of the cryogenic coolers and focal planes as high risks, but Air Force management generally believed these technologies would be developed by the DSARC Milestone II scheduled in FY 1986. However, the Deputy Assistant Secretary of the Air Force (Space Plans and Policy) in a 27 April 1983 memorandum, "SBSS Information," stated:

I strongly support the need for a Space Based Space Surveillance (SBSS) system. I am concerned, however, that with the present program we may find ourselves, once again, in the position of trying to develop the needed technology at the same time we are proceeding with contractor selection for system development.

TAB A

Because of these concerns, the Deputy Assistant Secretary held a thorough review of the SBSS program in March 1983 and concluded that the program may be overly success-oriented. He cautioned that the Air Force should not commit to full-scale development or overspend on concept definition until the required technology is available. If the technology is not satisfactorily developed and demonstrated, production components and subsystems may require modification, the schedule may be extended, and acquisition costs may increase.

b. Schedule Concurrency. The SBSS program acquisition strategy (as of July 1983) contained a highly concurrent, success-oriented schedule (see Schedule A-1). As a result, any technical or other problems that occur during development may cause schedule slips and cost increases. Specifically:

(1) Technology Development and Concept Exploration Are Concurrent. The concept exploration phase (which included limited demonstration and validation) and technology development were to be accomplished concurrently. The Program Office proposed to accomplish concept exploration in two phases. In Phase IA, projected to cover FYs 1984-85, at least two sensor development and two spacecraft development contracts were to be awarded. In Phase IB, projected for FY 1986, the best sensor and spacecraft contractors were to be identified and allowed to further develop and integrate their concepts and designs preparatory to the DSARC II review. Because technology and concept exploration are being developed concurrently, delays in technology development could translate into delays in the concept exploration phase and ultimately result in program cost increases.

(2) DSARC Milestone I Review and Demonstration and Validation Phase are Omitted. Full-scale development was to begin immediately after the concept exploration phase without the benefit of an in-depth demonstration and validation program approved by a formal DSARC Milestone I review. Program management officials did not plan to have a DSARC I review because they believed the program had been given sufficient visibility. For example, the results of the 1982 Space Surveillance Architecture Study (which was the basis for recommending the SBSS system) had been briefed to numerous Air Force and some DOD officials, including the Commander HQ AFSC, Secretary of the Air Force, Joint Chiefs of Staff, and the Principal Deputy Under Secretary of Defense (Research and Engineering). However, five of the seven permanent members of the DSARC had not been briefed on the status of the

TAB A

program or given the opportunity to comment on its direction. Further, DOD Directive 5000.1 states: "The Milestone I decision shall establish thresholds and objectives to be met and reviewed at the next milestone, the acquisition strategy for the recommended concepts...and a dollar threshold that cannot be exceeded to carry the program through the next milestone." Without a DSARC I review, distinct cost and performance thresholds and objectives would not be established to provide a basis on which the success of the program can be measured and resources committed for full-scale development and production at the Milestone II DSARC.

(3) Long-Lead Procurement Is Concurrent With Full-Scale Development. The Air Force planned to begin procurement of long-lead production items near the beginning of full-scale development. In addition, full production was scheduled to begin about 1 year before completion of full-scale development. As a result, the production systems could closely resemble the prototype system and may not be able to fully benefit from the testing to be accomplished during the full-scale development phase.

4. Recommendation 1. HQ USAF/RD, in coordination with HQ AFSC and the Space Defense Systems Program Office should request a DSARC Milestone I review be made at the end of Phase IA of the concept exploration phase or request the Defense Acquisition Executive to convene a Program Review to ensure that the SBSS acquisition strategy, including the concurrency and technological risk, is approved by the Office of the Secretary of Defense.

5. Management Comments. "Concur. A Defense Acquisition Executive convened Program Review will be requested. This review should occur after System Design Review (SDR) of the concept definition study. The SDR is currently scheduled for December 1985. Therefore, the Program Review should occur no later than February 1986."

6. Recommendation 2. HQ USAF/RD, in coordination with HQ AFSC and the Space Defense Systems Program Office should establish clear cost, schedule, and performance thresholds and goals which can be evaluated by the DSARC Milestone II review prior to approving the program for full-scale development and production. These thresholds and goals should be established in an approved system concept paper during preparations for the DSARC Milestone I review or Program Review recommended above.

7. Management Comments. "Concur. Clear cost, schedule, and performance thresholds will be available by the Defense Acquisition Executive convened Program Review discussed above (no later than February 1986)."

8. Evaluation of Management Comments. Management comments and actions planned are responsive to the issues and recommendations discussed in this tab.

SBSS PROGRAM SCHEDULE

<u>FY 1984</u>				<u>FY 1985</u>				<u>FY 1986</u>				<u>FY 1987</u>				<u>FY 1988</u>				<u>FY 1989</u>				<u>FY 1990</u>			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<u>: CONCEPT EXPLORATION</u>												:															
<u>TECHNOLOGY DEVELOPMENT</u>												:															
												: :DSARC II															
												: FULL-SCALE DEVELOPMENT															
												<u>: LONG-LEAD PROCUREMENT</u>															
																											: BLOCK I PRODUCTION

Note: This schedule reflects the acquisition plan as of July 1983. However, as of the date of this report, a revised acquisition strategy was under consideration which would extend full-scale development through FY 1994 and begin production in FY 1993.

COST ESTIMATING AND FUNDING

BACKGROUND

1. Cost Estimating Guidance. DOD Directive 5000.1, Major System Acquisitions, and the Deputy Secretary of Defense Initiatives on Improving the Acquisition Process both stress the need for realistic budget/cost estimating and adequate funding. Because a system's estimated cost affects its affordability when compared to overall Air Force and DOD budget priorities, cost is a primary factor considered by the Defense Systems Acquisition Review Council (DSARC) when determining whether a system should proceed to the next acquisition phase.

2. Program Stability and Deputy Secretary of Defense Initiatives. DOD Directive 5000.1 states, "Reasonable stability in acquisition programs is necessary to carry out effective, efficient, and timely acquisitions." To achieve stability, the Services are required to estimate and budget realistically and fund adequately. In addition, the following 30 April 1981 Deputy Secretary of Defense initiatives apply directly to accurate budget/cost estimating and adequate funding:

-- Initiative number 6 requires the Services to budget to most likely costs.

-- Initiative number 29 calls for DOD to integrate the Planning, Programming and Budgeting System and the DSARC process by requiring the Services to assure the DSARC that sufficient funding can be committed and is included in the Five Year Defense Program (FYDP) to carry out the proposed program.

DISCUSSION

3. Budget Adjustments are Required. Sufficient funds, in both amount and type, may not be available to ensure SBSS program stability and progress. The \$800 million (then-year dollars) requested in the USAF FY 1985-89 Program Objective Memorandum (POM) may be as much as \$1 billion (then-year

TAB B

dollars) short of the funding required to support the SBSS system concept envisioned as of July 1983. Additionally, the POM did not include long-lead procurement (appropriation 3020) funds required by the SBSS acquisition strategy. As a result, the Air Force may not be able to assure the DSARC that sufficient funding can be committed and is included in the FYDP to carry out the proposed program as required by the Deputy Secretary of Defense's initiative number 29.

a. Original Versus Current SBSS System Concept. The FY 1985-89 POM did not reflect funding required to support the current (July 1983) concept of the SBSS system.

(1) The system concept was based on the findings of the 1982 Air Force Space Surveillance Architecture Study and subsequent analyses conducted by HQ Space Command and Space Division. The funding requested in the POM, on the other hand, was based on a concept developed by a contractual (Science Application Inc.) study conducted from 1979-81.

(2) The 1982 Air Force Space Surveillance Architecture Study and its follow-on efforts were accomplished to identify and develop a fully operational space surveillance system in the near term. The 1979-81 contractual study, however, was performed primarily to demonstrate the capability of the longwave infrared technology for the Space Infrared Sensor Program and to develop a SBSS baseline system concept to meet the mission performance objectives. This original concept called for a system with significantly less endurability, survivability and operational capability than envisioned in the SBSS concept as of July 1983. Because of the significant differences between these design concepts, the Program Office directed its support contractor (Aerospace Corporation) to develop a new cost estimate in the spring of 1983 to more accurately reflect the cost of the SBSS system. Preliminary results indicated that the budget requests in the FY 1985-89 POM could be understated by about \$1 billion (then-year dollars).² This amount, however, had not been thoroughly reviewed or approved within the Air Force.

² As of the date of this report, the Program Office was in the process of finalizing a new SBSS cost estimate and acquisition strategy. The result of this effort may impact the funding shortfall discussed in this report.

b. Type of Funding. The type of funds requested in the FY 1985-89 POM was not consistent with the Program Office acquisition strategy as of July 1983. The acquisition strategy called for long-lead procurement actions, preparatory to Block I production, to begin in FY 1987. To do this, central procurement (appropriation 3020) funds would be required in the FY 1987-89 budget. However, the FY 1985-89 POM did not include procurement funds for the SBSS program. The Program Office's original budget request, submitted in September 1982, proposed that \$73.7 million of research, development, test and engineering funds (appropriation 3600) be converted to central procurement funds for long-lead purchases. However, during HQ AFSC and USAF reviews of the budget submission, the proposal was rejected primarily because Air Force management officials determined that the amounts requested for procurement funds were not sufficiently accurate to submit for DOD and Congressional consideration.

4. Recommendation 3. HQ USAF/RD, in conjunction with HQ AFSC and the Space Defense Systems Program Office should require that the current SBSS cost estimate be thoroughly reviewed and approved, and the FY 1986-1990 Air Force POM be adjusted accordingly to reflect the updated SBSS concept, including an estimate for central procurement funds.

5. Management Comments. "Concur. The most recent SBSS cost estimate (October 1983), representing a more survivable total system and a somewhat revised acquisition strategy has been included in the FY86-90 POM by the Space Defense Systems Program Office. The POM adjustment will be made in FY90 and will not increase funding required in FY86-89. Review and approval will be accomplished during the normal PPBS cycle, nominally June 1984."

6. Evaluation of Management Comments. Management's ongoing actions to refine the program cost estimate and revise the acquisition strategies and program schedule are responsive to the issues and recommendations discussed in the tab. Since concept definition, acquisition strategies, and cost estimates are subject to considerable change during the early stages of a program's acquisition cycle, we will continue to monitor management actions during the audit followup process.

LOCATIONS AUDITED/REPORTS ISSUED*

Organization/Location

Headquarters United States Air Force

Comptroller of the Air Force (AF/AC)

ACS, Intelligence (AF/IN)

DCS, Research, Development and
Acquisition (AF/RD)

DCS, Plans and Operations (AF/XO)

Air Force Systems Command (AFSC)

Headquarters, AFSC
Andrews AFB, MD

Space Division
Los Angeles Air Station, CA

Strategic Air Command (SAC)

Headquarters, SAC
Offutt AFB, NE

Space Command (SPACECOM)

Headquarters, SPACECOM
Peterson AFB, CO

* No installation-level reports were issued.